



Heart Failure: Common Management Options for Everyday Practice

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State President of United Advanced Practice Registered Nurses of Georgia

UAPRN West Georgia 16th Annual Education Conference

March 4, 2023

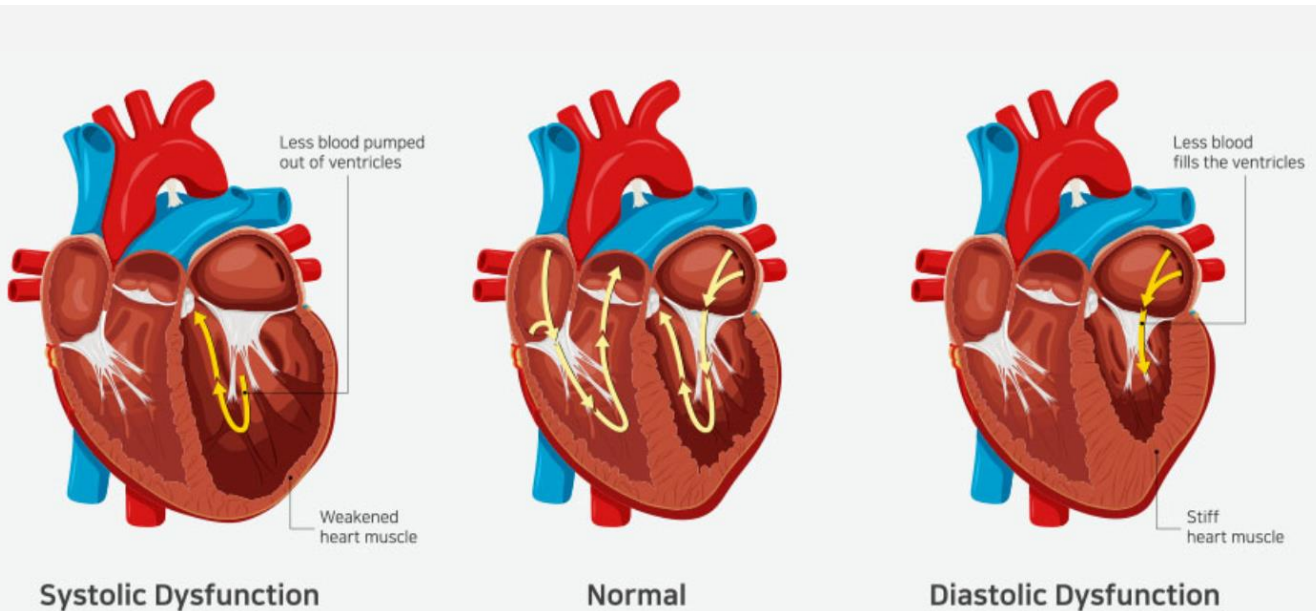


Heart failure is a pervasive and progressive disease. At the time of diagnosis, regardless of etiology, only 50% of patients will survive the next 5 years.

Heart Failure Categories

- ▶ **Systolic**
- ▶ **Diastolic**

- ▶ **Ischemic**
- ▶ **Non-ischemic**



- ▶ Hypertrophic, restrictive or infiltrative from fibrosis/ amyloid/ sarcoid/ scleroderma; arrhythmogenic, non-compaction, inflammatory like hypereosinophilic syndrome or acute myocarditis; infectious like viral myocarditis, Chagas (protozoal), Lyme, toxins, alcohol, thyrotoxicosis or myxedema, pregnancy, chemo, radiation, carcinoid, etc . . .

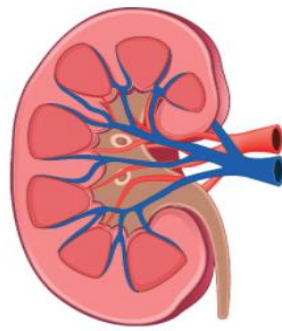
<https://www.netmeds.com/health-library/post/heart-failure-symptoms-causes-types-and-treatment>

GDMT: Guideline Directed Medical Therapy

- ▶ ACC/AHA
- ▶ High levels of evidence for prolonging life, not just relieving symptoms.
- ▶ 60% of patients will have positive remodeling in response to appropriate, early GDMT
- ▶ Inhibit RAAS!

RAAS

Triggers:
Low Volume
Low O₂
Low Na⁺



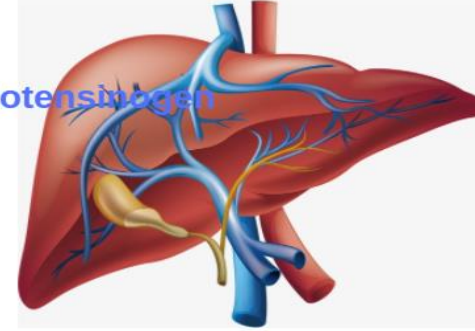
Renin

Angiotensinogen

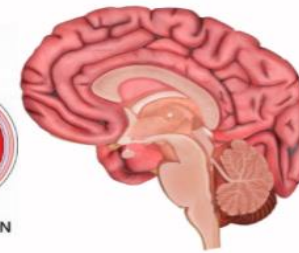
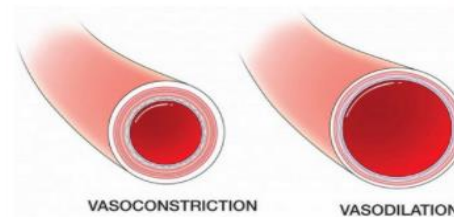
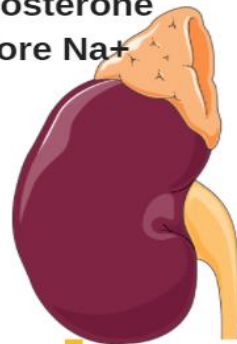
Angiotensin I

Angio-converting
Enzyme (ACE)

Angiotensin II

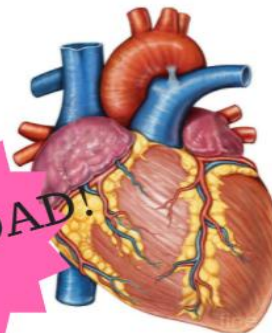


Aldosterone
More Na⁺



Anti-diuretic Hormone
(ADH) Thirst/Drinking

OVERLOAD!



Pillars of GDMT



BB: Beta Blocker

ACEi: ACE-inhibitor

ARB: Angiotensin-Receptor Blocker

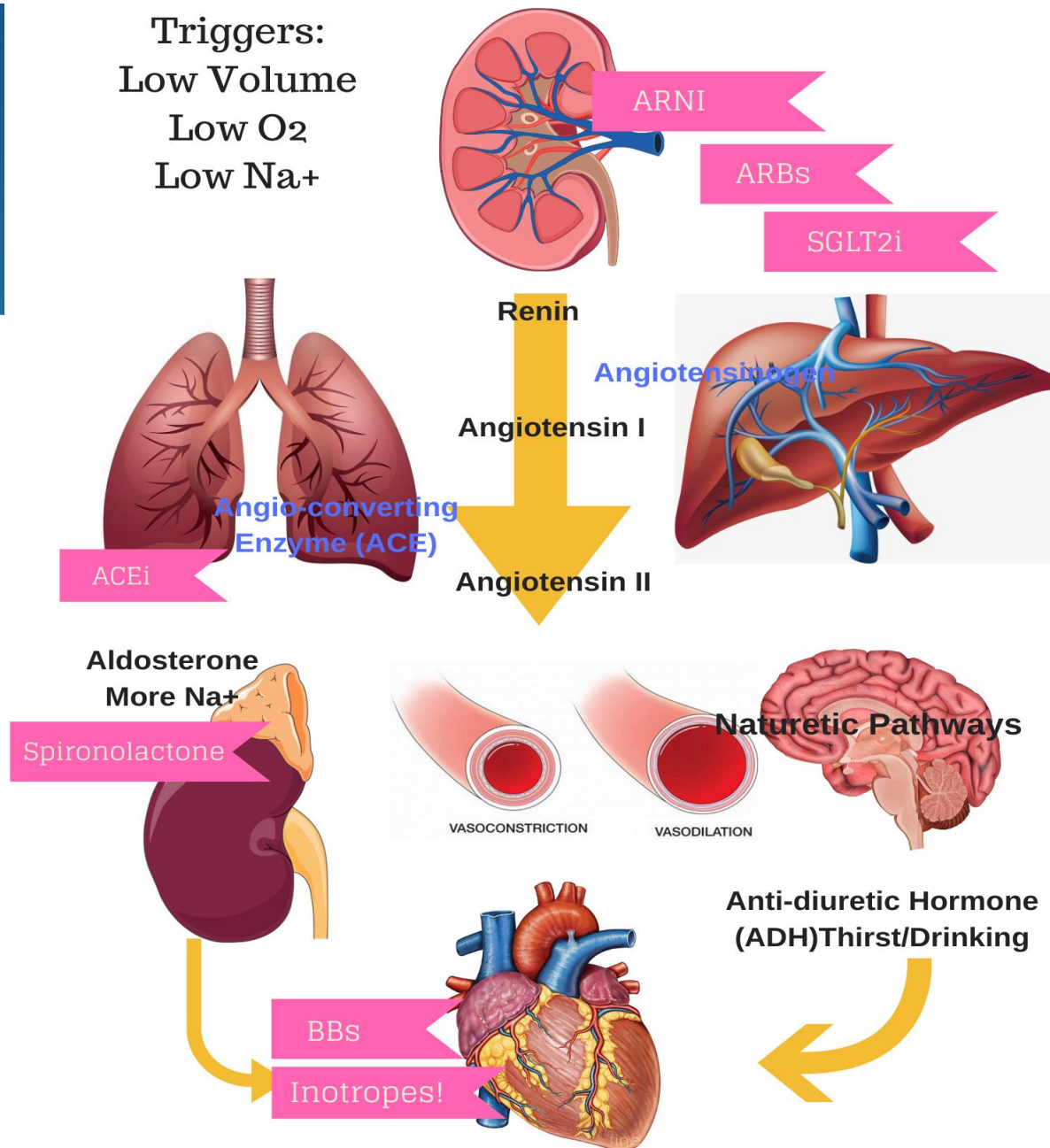
ARNI: Angiotensin Receptor and Neprilysin Inhibitor

MRA: Mineralocorticoid receptor antagonist

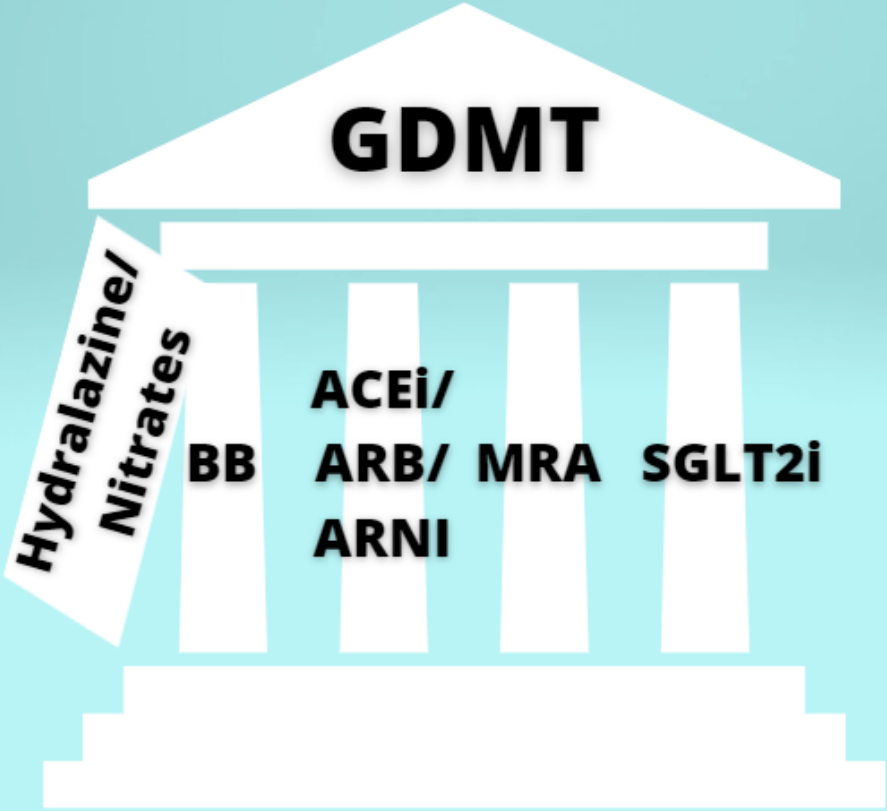
SGLT2i: sodium glucose co-transport 2 inhibitor

Renin-Angiotensin-Aldosterone System

Triggers:
Low Volume
Low O₂
Low Na⁺



GDMT

A diagram of a classical temple with four columns. The pediment contains the text 'GDMT'. The columns from left to right are labeled: 'Hydralazine/ Nitrates' (written vertically), 'BB', 'ACEi/ ARB/ ARNI', 'MRA', and 'SGLT2i'. The temple sits on a three-tiered base.

**Hydralazine/
Nitrates**

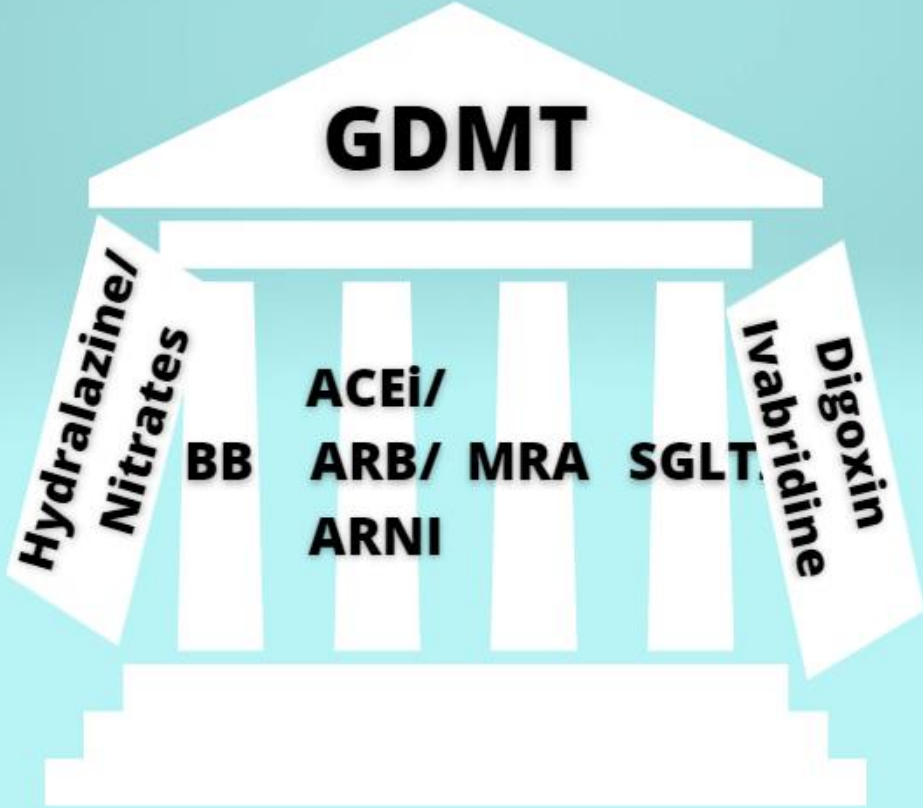
BB

**ACEi/
ARB/
ARNI**

MRA

SGLT2i

GDMT

A diagram of a classical temple with four columns. The pediment contains the text 'GDMT'. The columns from left to right are labeled: 'Hydralazine/ Nitrates' (written vertically), 'BB', 'ACEi/ ARB/ ARNI', 'MRA', and 'SGLT2i'. To the right of the temple, a separate column is labeled 'Digoxin'. The temple sits on a three-tiered base.

**Hydralazine/
Nitrates**

BB

**ACEi/
ARB/
ARNI**

MRA

SGLT2i

Digoxin

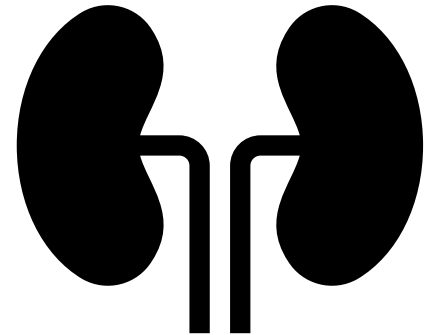
ACEi/ARB/ARNI

- ▶ ACE inhibition
 - ▶ Watch renal function and potassium
 - ▶ Can cause hypotension, cough
- ▶ Angiotensin Receptor Blocker
 - ▶ Watch renal function and potassium
 - ▶ Can cause hypotension
- ▶ Nephrolysin Inhibitor
 - ▶ Acts in neuro-hormonal pathway
 - ▶ Can cause “happy buzz” first few days
 - ▶ Can cause profound hypotension



Titration of ACEi/ARB/ARNI

- ▶ ARB or ARNI preferred option
 - ▶ Better positive remodeling response
- ▶ ACEi only if intolerant of ARB/ARNI
 - ▶ **Lisinopril 2.5 mg daily still provides some RAAS inhibition**
- ▶ If on high dose ACEi, wash out with ARB 36 hours prior to starting ARNI
 - ▶ Lisinopril 20 → Losartan 25 → Sacubatril/valsartan 24-26 mg BID
 - ▶ ARNI initiation best when still slightly wet



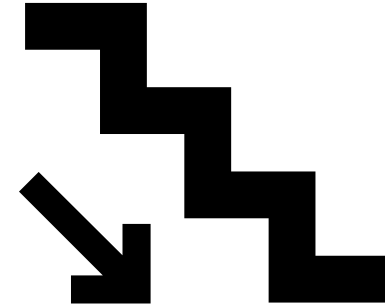
Beta Blockers

- ▶ Important for cardiac rest and positive remodeling
- ▶ Negative chronotrope
- ▶ Negative inotrope
- ▶ Fatigue, dizziness
- ▶ Watch for bradycardia and hypotension



Titration of BB

- ▶ Decrease dose or hold in acute exacerbation
- ▶ Potentially add or up-titrate last (low EF)
- ▶ AVOID in most restrictive cardiomyopathies
 - ▶ $HR \times SV = CO$
- ▶ Lopressor is short acting but has not been shown to improve outcomes in trials (ACC/AHA).
- ▶ **Prefer carvedilol or Toprol XL**
- ▶ Toprol is longest acting but lowers the BP the least



Titration of MRA

- ▶ Spironolactone (Aldactone)/ eplerenone (Inspra)
- ▶ Excellent RAAS inhibition with minimal effects on BP
- ▶ Can be tolerated even in mild renal dysfunction, monitor K⁺
- ▶ Watch for breast tenderness, growth, lactation
- ▶ May also inhibit orgasm



Titration of SGLT2i: DAPA-HF

- ▶ Dapagliflozin (Farxiga) / empagliflozin (Jardiance)
- ▶ Start 5 mg, increase to 10 mg (dapagliflozin)
- ▶ **Patient does not have to be diabetic**
 - ▶ **Contraindicated in Type I DM**
- ▶ Decrease diuretic dose when initiating in stable patients.
- ▶ Monitor for euglycemic DKA
- ▶ Do not give to patients with frequent UTI or severe renal impairment (GFR < 20)



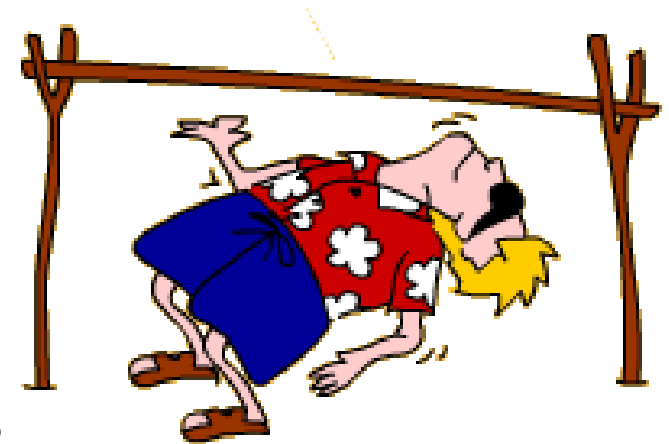
Other Additions

- ▶ **Nitrates** such as Hydralazine, Isordil (isosorbide dinitrate or isosorbide mononitrate)
 - ▶ Excellent if cannot tolerate ACEi/ARB/ARNI
 - ▶ Better outcomes in Black Americans
 - ▶ Add if at max doses of ACEi/ARB/ARNI and still hypertensive
 - ▶ Monitor for headache
 - ▶ TID dosing may be difficult for some patients
- ▶ **Digoxin**
 - ▶ Pro-inotrope
 - ▶ Avoid in renal dysfunction or bradycardia
- ▶ **Ivabradine** (Corlanor)
 - ▶ Only add if symptomatic with tachycardia and at highest doses of BB already



Is There Such A Thing As Too Low? (SBP)

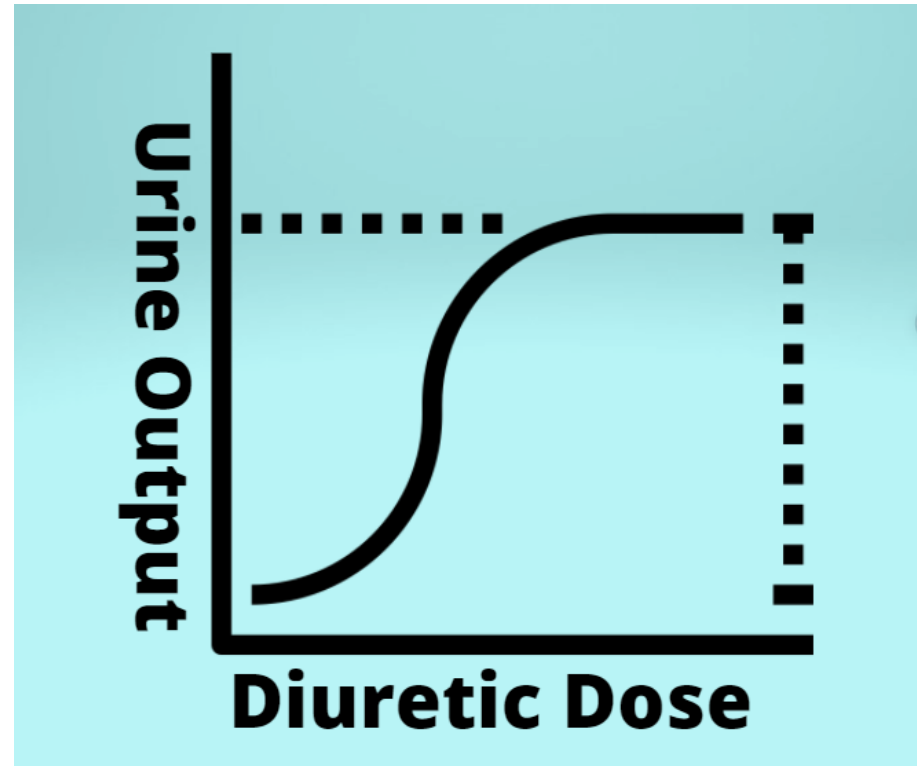
- ▶ If the patient is asymptomatic and maintains baseline renal function, then the highest tolerated doses of GDMT is optimal.
- ▶ Is SBP 140? NOT optimized!
- ▶ Is SBP 130? NOT optimized!
- ▶ Is SBP 120? You can still go lower!
- ▶ **Is SBP 90? That's fine, as long as the patient is asymptomatic and there is no rise in sCr.**



Diuretic Dosing and Titration

The greater the loop diuretic dose, the greater the urine output - to a limit.

When that limit is reached (the UOP tapers off but the patient is still overloaded) then adding a thiazide diuretic can assist with further diuresis.



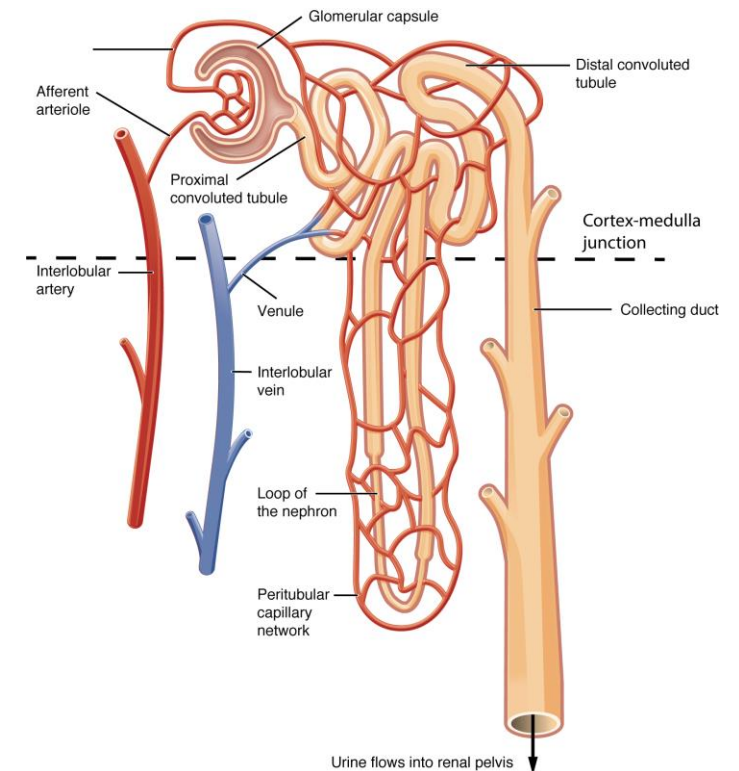
PO Loop Diuretic Equivalents

- ▶ Furosemide (Lasix) 20 mg
- ▶ Bumetanide (Bumex) 0.5 mg
- ▶ Torsemide (Demedex) 10 mg



Thiazide and Thiazide-Like Drugs

- ▶ **Metolazone 2.5, 5, 10 mg; only PO**
- ▶ **Hydrochlorothiazide 12.5, 25, 50 mg**
- ▶ **Chlorthalidone 25, 50 mg**
- ▶ **Chlorothiazide (Diuril) 250 - 500 mg; IV or PO**



Another Addition

- ▶ **Diamox (acetazolamide)** is a carbonic anhydrase inhibitor that can potentiate diuresis by pushing bicarb out of the tubules.
- ▶ Loop diuretics push hydrogen ions along with sodium through the tubules. When the serum bicarb ($s\text{CO}_2$) rises during diuresis then we sometimes refer to this as “contraction alkalosis”
- ▶ Diamox can assist with diuresis as well as pH balance (but only to an extent).

Dosing in Diuretic Naive

- ▶ Multiply the serum creatinine by 20 to equal the furosemide dose
- ▶ **sCr x 20 = Lasix mg**

Dosing in the Diuretic Resistant

- ▶ Multiply the serum creatinine by 40 (twice the 20) for furosemide dosing.
- ▶ **sCr x 40 = Lasix mg**
- ▶ OR at least twice their PO home dose converted to IV
- ▶ **Home dose (x2) = IV dose**

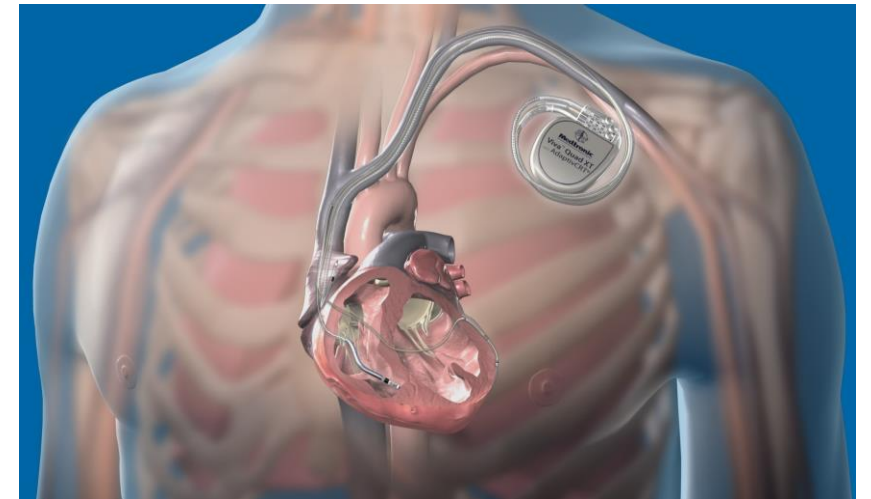
Drugs to Avoid

- ▶ CCB if LVEF < 40%
- ▶ NSAIDs
- ▶ Steroids
- ▶ Tricyclic antidepressants
 - ▶ Negative Inotrope, proarrhythmic



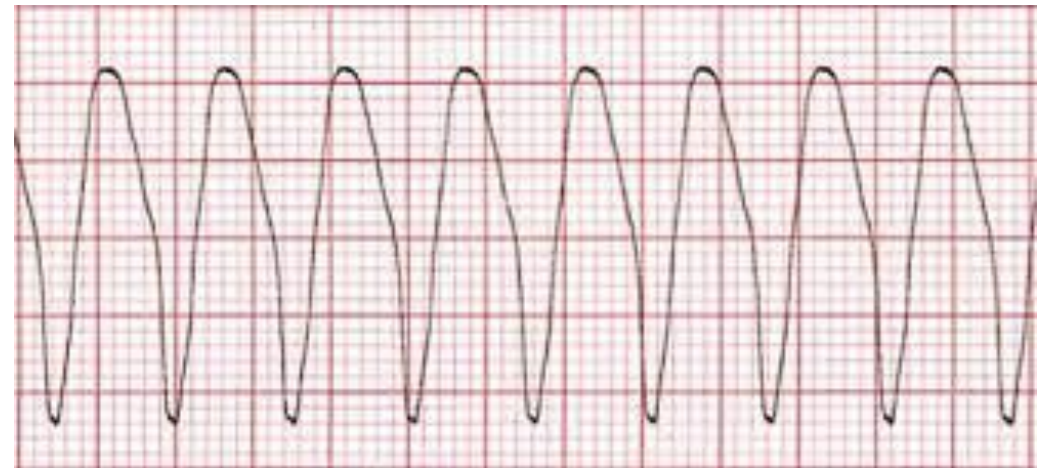
Supporting Structures

- ▶ CRT – Cardiac Resynchronization Therapy
- ▶ Possible ICD
- ▶ Anticoagulation if indicated
- ▶ ASA and statin if indicated
- ▶ Advanced Supportive Options
 - ▶ Inotropes such as milrinone
 - ▶ **Once inotrope-dependent, survival is 20% in one year**
- ▶ Advanced Surgical Options
 - ▶ LVAD
 - ▶ Heart transplant



Ventricular Tachycardia

- ▶ Inversely related to LVEF
- ▶ Increases with ventricular irritation
 - ▶ Inotropes (milrinone, dobutamine, etc)
 - ▶ Low electrolytes ($K^+ < 4$, $Mg^{++} < 2.5$)
 - ▶ Poor cardiac perfusion
- ▶ Concerning only when sustained (30-60 seconds or longer) or when patient is symptomatic.



COVID-19 and HF



- ▶ Immunization is best
- ▶ Myocarditis affects 1:50 of every infected patient (alpha and delta variants)
- ▶ Patients on immunosuppressants may not have antibody response to 1st and 2nd dose of mRNA vaccine, but **33-50% will develop an antibody response after a third dose.**

When to Refer?

- ▶ Anyone with a diagnosis of heart failure should be seen in the heart failure clinic at least once.
- ▶ Early rather than late.
- ▶ When a referral to EP for ICD is made.
- ▶ When medication doses have to be decreased because of hypotension.
- ▶ Anyone who has had a hospital admission for HF exacerbation.

I NEED HELP

When to Refer for Advanced HF Therapies

I
N
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D
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E
L
P

Inotropes

NYHA Class /
Naturetic Peptides

End-Organ
Dysfunction

Ejection Fraction

Defibrillator Shocks

Hospitalizations

Edema/
Escalating Diuretics

Low BP

Prognostic Meds

Previous or ongoing

Persistent Class III or IV
symptoms, persistently
elevated BNP/NTproBNP

Worsening renal or liver
dysfunction

Very low,
less than 20%

Recurrent, appropriate
shocks

More than one
hospitalization in the last
12 months

Persistent overload,
increasing diuretic dose
need

Consistently low,
SBP <90-100

Inability to increase GDMT
or need to decrease doses

Why Refer?

- ▶ Access to resources (Nutritionist, etc)
- ▶ More aggressive GDMT (SGLT2i coupons, samples)
- ▶ Ability to give IV diuretics
- ▶ CardioMEMs evaluation
- ▶ Advanced surgical options evaluation

CardioMEMS

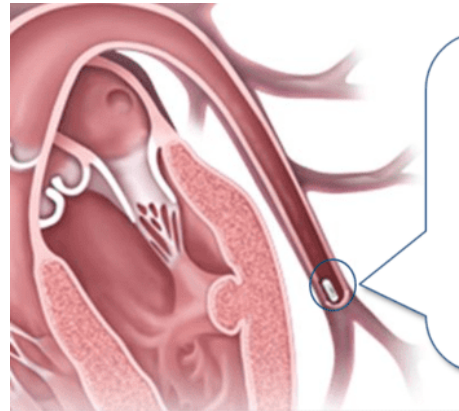
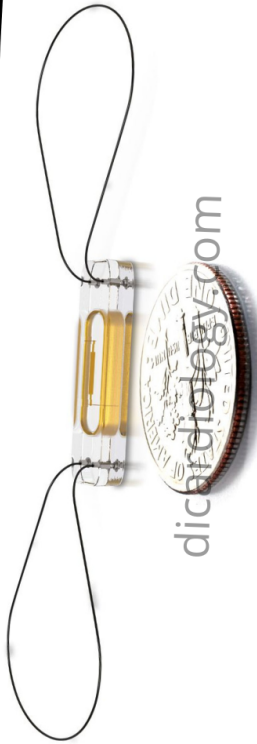
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PA Pressure-guided heart failure therapy:
Decreased PA pressures
Decreased HF hospitalizations by 58%
Across all EF ranges
Across sex and race
Decreased all-cause hospitalization by 28%

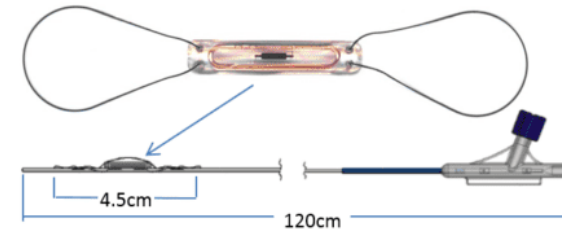
ABBOTT

Sponsor of the GUIDE-HF trial investigating CardioMEMS implanted PA pressure monitoring.

@AAHFN_



PA Sensor and Delivery System



Patient Electronics System



PA Pressure Database



Physician Access Via Secure Website

GUIDE-HF

Co-morbidities to Treat

- ▶ 60% of patients with heart failure also have **obstructive sleep apnea**
 - ▶ Appropriate screening STOP-BANG
 - ▶ Appropriate referral and follow up
- ▶ One in five will have **severe depression**
 - ▶ Avoid TCA if possible
 - ▶ Utilize resources like Gene-Sight
- ▶ **Iron deficiency** is noted in ~60% of patients including those without anemia
 - ▶ IV iron replacement can increase NYHA Class functional capacity

Case Study

- ▶ Mr. Smith is a 65-year-old AAM with history of MI / CAD / s/p CABG x 3 vessels 10 years ago. He developed worsening symptoms two years ago and echo showed new LVEF 30%. His symptoms improved on the following regimen:
 - Lisinopril 20 mg daily
 - Carvedilol 25 mg twice a day
 - Spironolactone 50 mg daily
 - Lasix 40 mg daily

Case Study

- ▶ He presents today for follow up and report worsening lower extremity edema, increased orthopnea (using 4 pillows at night), and decreased urine output to his Lasix dose. His vitals and labs are normal. What changes would you make to his regimen?

Case Study

- ▶ It has been one year since Mr. Smith last required medication changes. He presents to clinic today stating he is feeling worse than ever. He has worsening symptoms with minimal exertion, poor appetite, has been losing weight, and has not had any improvement in his leg edema or urinary output even with Lasix 80 mg daily.

His HR is 55, BP 100/60, RR 25 at rest, SaO₂ 98%
Labs show his Na⁺ 130, K⁺ 4.5, sCr 1.8 (baseline 1.1)

What would you change?

Samsky Advanced Heart Failure Clinics

- ▶ 404-605-5140
- ▶ 404-605-3100
- ▶ Direct: 404-605-5566
- ▶ Fax: 404-609-6790
- ▶ **Columbus: 706-649-6600**
- ▶ Fayetteville: 770-719-6747
- ▶ Athens: 706-475-1700
- ▶ Any of the AHF APPs are also able to assist.

Questions?

References / Resources

Bozkurt, B. What Is New in Heart Failure Management in 2017? Update on ACC/AHA Heart Failure Guidelines. *Curr Cardiol Rep* 20, 39 (2018). <https://doi.org/10.1007/s11886-018-0978-7>

McMurray, John; et al (2019): A trial to evaluate the effect of the sodium –glucose co-transporter 2 inhibitor dapagliflozin on morbidity and mortality in patients with heart failure and reduced left ventricular ejection fraction (DAPA-HF). *European Journal of Heart Failure* 21 March 2019 <https://doi.org/10.1002/ejhf.1432>

Yancy, Clyde; et al (2017): 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. *J Am Coll Cardiol*. 2017 Aug, 70 (6) 776–803

Abbot
ACC
AHA
HFSA
AAHFN